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ECKENFELDER INC. 17 7 0548

February 10, 1995 9420

J. Andrew Goddard, Esq.
Bass, Berry & Sims
First American Center
Nashville, TN 37238

RE: Professional Opinion Regarding the Hydrogeology of the Saad Site and Surrounding area, Nashville, Tennessee

Dear Mr. Goddard:

Per your request, I have reviewed the December 4, 1994 and January 18, 1995 Status Reports for the Hydrogeologic Investigation, Saad Trousdale Site, Nashville, Davidson County, Tennessee; a letter from Fred Stroud (USEPA) to J. Andrew Goddard dated January 21, 1995; a USEPA document for a Renewed Motion for an Order in Aid of Access; and other relevant technical data related to the Saad Site. In addition, I am familiar with the regional hydrogeology of the Nashville area including the characteristics of groundwater movement in the Bigby-Cannon limestone, and have direct practical experience in contaminant and karst hydrology and dye tracing. I have acquired this experience during previous employment as manager of the Kentucky Groundwater Branch and as a consultant to numerous clients including the USEPA.

The following comments are offered per your request:

- The letter from Mr. Fred Stroud (USEPA) to Drew Goddard Esq. (January 21, 1994) states that EPA's Groundwater Section is of the opinion that groundwater at the Site is "potential drinking water." Most of Davidson County (including the Site) is served by a public water system which utilizes the Cumberland River as a source. The Saad Site is located in an industrial area bounded by the CSX rail yard and various service and manufacturing operations. It is highly unlikely that anyone is or would use groundwater in the area as a drinking water source. As part of the tracer test study conducted around the CSX/Saad/GE area, a field survey was performed by EPA representatives for the presence of water wells, springs, sinkholes, and sinking streams. This survey covered a multi-square mile area around the Site and did not indicate the presence of any water wells or other public or domestic potable water sources derived from groundwater.

227 French Landing Drive
Nashville, Tennessee 37228
615.255.2288
FAX 615.256.8332

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- Groundwater removal on the CSX property, associated with construction of an Aboveground Storage Tank (AST), may have distorted the groundwater flow field and resulted in erroneous tracer test results for dye injected on the CSX and Saad property. The potentiometric surface map prepared for the EPA study appears to be based on a limited number of data points collected before groundwater pumping associated with the AST began. We would expect the tracer test data to indicate flow perpendicular to contour lines of the map; however, the Saad Site tracer test data indicate that groundwater flows parallel to the contour lines. These observations indicate that the flow field has been distorted during pumping activities or the potentiometric surface data are incorrect or insufficient.

- The Ogden (CSX) monitoring well, located approximately 100 feet from the Saad Site, has been monitored weekly or biweekly since September 17, 1994. EPA only obtained a positive result for the last sampling period (December 22, 1994). Usually, more than one positive result should be obtained from a sample site before a positive trace is confirmed. In addition, the detection of dye in this well may be related to groundwater pumping related to the AST.

- A connection of groundwater from the Saad Site (or CSX property) to the Croft Spring at Grassmere Wildlife Park has not been proven by the tracer tests. The tracer test from the Saad Site began on September 17, 1994 with the injection of dye and has been in progress for 4 1/2 months. Groundwater movement beneath the fill area at the Saad Site is very slow and suggests Darcian rather than conduit flow conditions. These data indicate that rapid migration of groundwater or any constituents of interest from the fill material at the Saad Site is therefore highly unlikely.

- Weekly positive detections of optical brightener in the CSX Radnor Yard AST construction area were noted in the EPA Status Report. The collection of background samples before injection of the dye was not indicated in the report. The failure to collect background samples for optical brightener at the AST Site calls into question whether the dye detected is from the EPA tracer tests or if it is associated with the other sources of this material at the CSX Radnor yard. Optical brighteners, of which Tinopol CBS-X is one of many, are common constituents in a variety of detergents, cleaning formulations, starch products, plastics, natural and synthetic fibers, waxes, and coatings. It is logical to assume that these substances are transported through (via rail car) or are used on the Radnor Yard. Failure to collect background samples at the Radnor yard AST prior to injecting dye (optical brightener) renders these data questionable.

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- The Crawford and Associates, Inc. laboratory procedures were compared to commonly expected Quality Assurance/Quality Control procedures for the various EPA methods, such as are used in the ECKENFELDER INC. laboratory. The use of trip blanks, method blanks, field duplicates, instrument calibrations, and laboratory control standards described in the QA/QC Plan presented in the Status Reports follows typical EPA protocols very closely. However, matrix spikes, which are a major component of a typical QA/QC program conducted under EPA auspices, do not appear to have been conducted.

  A matrix spike is used to confirm whether the analyte in question, if present, would be detected by the analytical method. The matrix spike in a dye study shows if it is possible for dye breakthrough to occur but be missed because other materials in the water prevent the dye from being adsorbed onto the dye detector, or from being accurately measured by the analytical techniques. The possibility of undetected breakthrough was discussed in the tests reported in Appendix I of the December 4, 1994 Status Report.

  One of the tests performed in the December 4, 1994 Status Report seemed to be designed to address the issues of matrix interference of hydrocarbons with the measurement of dyes directly in the water samples. However, neither the constituents nor the quantity of organic materials in the test water were determined. The other two tests did not adequately test whether the receptor would pick up the dyes after prolonged exposure to the other materials which might be in the water. The tests should have used receptors from dye monitoring points which, after being analyzed for dye, were then exposed to dye-laden water in the laboratory. As a control for the test, an unused receptor should be exposed to another aliquot of the dye-laden water. In the tests as performed, the dye was allowed to compete for adsorption sites with the other materials in the water. Since the final analysis is not quantitative, one cannot judge whether or not matrix interference was occurring.

  The tests as performed would suggest that, if a fresh receptor had been put in place during dye breakthrough, the presence of the dye should have been detected. Therefore, any dye breakthrough event which was longer than the sampling interval for dye receptors should have been measured. In the case where breakthrough time for a particular dye was less than the sampling interval measured, the dye receptors could have missed dye passing through the dye monitoring point resulting in a false negative result.

- The Status Reports indicated that the Crawford and Associates, Inc. laboratory performed trip blanks, method blanks, field duplicates,

instrument calibrations, and laboratory control standards; however, none of these data were included in the Status Reports. To adequately evaluate the quality of the data presented in the reports, these data should have been included.

- The January 18, 1995 Status Report stated that someone may have placed eosine and fluorescein dye at the Saad Site just before and/or during the tracer tests, thereby sabotaging the results. Crawford also noted that dye could have been present at the Saad Site prior to the start of the tracer tests, perhaps from traces attempted in the past. A review of past studies, and discussions with *de maximis, inc.*, did not indicate that tracer testing has been conducted from the Saad Site previous to EPA's tracer tests. The background dye detectors for the EPA study indicate the presence of eosine and fluorescein in wells on the Saad Site. *de maximis, inc.* reports that photos from the Site taken in October 1991 show a brilliant green fluorescein like color in pools of water at the Site. Fluorescein is a common colorant in antifreeze and has been detected in many of the background samples collected for the tracer test study. A review of the literature indicates that eosine is commonly used to color motor fuels and other organic chemicals. It seems most likely that the presence of fluorescein and eosine dyes at the Site is a result of past releases associated with industrial practices at the Saad Site, rather than intention disruption of the test.

Thank you for the opportunity to review these reports and documents. If you have any questions, please feel free to contact me.

Sincerely,

ECKENFELDER INC.

Geary M. Schindel, P.G.
Project Manager

cc. *de maximis, inc.*

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